they do not include reference signs mentioned in the description. Although the Examiner has referenced Fig. 4 on pages 15-16, Applicant points out that the reference to Fig. 4 is directed to bores 18 and that the remaining reference numbers apply to Fig. 8. Accordingly, Applicant has substituted a corrected Fig. 8 which includes all of the reference numbers noted by the Examiner on page 3 of the Examiner's Office Action.

35 U.S.C. §102(b) Rejections

Claims 1, 11, 21, 24, 52, 62, 75, 78 and 88 stand rejected under 35 U.S.C. §102(b) as being anticipated by *Kondo et al.*, U.S. Patent No. 6,117,775, (hereinafter "*Kondo*"). In particular, the Examiner states that *Kondo* teaches a polishing method for removing a metal surface where the metal is oxidized to form a thin removable oxide film which includes the steps of causing a wafer to contact a polishing pad and rotating the wafer and pad, and supplying a slurry having less than 1 wt % of polishing abrasive between the wafer and the pad. The Examiner further states that since the method described in *Kondo* comprises the same step as that of the claim, the abrasive step would have a rate associating with it and therefore it would also be a rate-determining step of the removal mechanism. The Examiner further states that with reference to claim 24, the friction between the wafer and polishing member while rotating would establish a temperature at the contact area while polishing or distributing the slurry. Finally, in referring to claims 52 and 78, the Examiner states that the metal to be polished is copper and that the down force is 220 g/cm^2 or 3.13 psi in the *Kondo* reference and that the rate of removal of the copper surface would have to be approximately proportional to the contact pressure since a higher pressure would increase the polishing rate and a lower pressure would slow down the polishing rate. Applicant respectfully traverses this rejection.

To anticipate a claim for a patent, a single prior source must contain each of its limitations. Hybritech, Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1376, 231 U.S.P.Q. 81, 90 (Fed. Cir., 1986); In re Donohue, 766 F.2d 531, 226 U.S.P.Q. 619, 621 (Fed. Cir., 1985). Further, 35 U.S.C. §102(b) states that "a person shall be entitled to a patent unless the invention was patented or described in a printed publication in this or a foreign country, more than one year prior to the date of application for patent in the United States."

Kondo generally discloses polishing a metal film formed on an insulating film having a groove where the polishing is done with a polishing solution that contains an oxidizer and a substance which renders oxides water-soluble. The polishing solution does not include a polishing abrasive or, alternatively, includes a polishing abrasive at a low concentration of less than 1 wt % and which has a pH and oxidation-reduction potential within the domain of corrosion of the metal film.

Applicants' amended independent claims 1, 24 and 78 each include a process where a polishing solution having less than 1 wt % of a polishing abrasive is distributed at a contact area between the workpiece and the polishing member through at least one bore formed in a platen connected to the polishing member to effect a removal rate for removal of the film during the abrasive step, and establishing a temperature at the contact area by heating and cooling the polishing solution before causing the polishing solution to be distributed to the contact area. Unlike Applicants' claimed invention, *Kondo* fails to disclose a platen having at least one bore formed therethrough for distribution of a polishing solution and further fails to disclose establishing a temperature at the contact area by heating and cooling the polishing solution before distributing the polishing solution to the contact area. Therefore, in that *Kondo* fails to disclose each element of Applicants' claimed invention, Applicants' amended claims 1, 24 and 78, and the claims which variously depend therefrom, cannot be anticipated by *Kondo*. Accordingly, Applicants respectfully request the withdrawal of the Examiner's 35 U.S.C. §102(b) rejection of claims 1, 11, 21, 24, 52, 62, 75, 78, and 88 based on *Kondo*.

35 U.S.C. §103(a) Rejections

Claims 2, 4, 28, 30, 53, 55, 79 and 81 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Kondo* as applied to claims 1, 24, 52, and 78 above, and further in view of *Beardsley et al.*, U.S. Patent No. 6,135,865 (hereinafter "*Beardsley*"). More specifically, the Examiner states that although *Kondo* doesn't describe supplying slurry through a plurality of pores in the pad and through at least one pore in the platen connected to the pad, *Beardsley* teaches a CMP apparatus which supplies a slurry through a porous pad and through holes formed in the platen connected to the pad. The Examiner therefore contends that it would have been obvious for one having ordinary skill in the art to modify *Kondo*'s method in light of *Beardsley*'s slurry distributing system because *Beardsley* teaches that the slurry distributing system is

inexpensive and uncomplicated and would distribute slurry more uniformly on the pad to have a more uniform polishing action. Applicants respectfully traverse this rejection

Beardsley discloses a CMP apparatus having a rotating platen with a recess which has a first portion in communication with a delivery means for delivering slurry into the first portion and a second portion extending under the polishing pad. Slurry is delivered from the first portion of the recess to the second portion of the recess and then to the upper surface of the pad where it aids in the polishing of the substrate. In contrast to the Examiner's contention, *Beardsley* fails to disclose a platen having through holes formed therethrough which is connected to a porous pad. Instead, *Beardsley* discloses a platen having a recess with first and second portions where a sprinkler means, such as a sprinkler hose with spray holes is disposed in the second portion of the recess. (See Column 5, Lines 50-63). Moreover, neither *Kondo* nor *Beardsley* disclose the step of establishing a temperature at a contact area where a wafer contacts a polishing member by heating and cooling a polishing solution before distributing a polishing solution to the contact area. Accordingly, in that neither *Kondo* nor *Beardsley* discloses each and every element of Applicants' claimed invention, either alone or in combination, Applicants' claims cannot be obvious in light of the *Kondo* and *Beardsley* references.

Claims 3, 5, 29, 31, 54, 56, 80 and 82 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Kondo* as applied to claims 1, 24, 52 and 78 above, and further in view of *Sato*, U.S. Patent No. 5,246,525 (hereinafter "*Sato*"). In particular, the Examiner states that although *Kondo* does not describe supplying slurry through a channel formed in the pad and through at least one pore which is formed in a platen and collinear with the channel. *Sato* does describe a polishing apparatus where slurry is supplied through a channel formed in the pad and a pore formed in the platen which is collinear with the channel formed in the pad. The Examiner therefore contends it would have been obvious to modify *Kondo*'s method in light of *Sato*'s slurry distribution system because *Sato* shows that slurry can be distributed uniformly on the pad and therefore would help to more uniformly polish the wafer. Applicants respectfully traverse this rejection.

Although *Sato* discloses a plurality of slurry supply ports concentrically located on the pad through the polishing plate, neither *Sato* or *Kondo* discloses the step of establishing a

temperature at the contact area of the wafer and polishing member by heating and cooling a polishing solution before distributing the polishing solution at the contact area as required by Applicants' claims. Therefore, it would not have been obvious to one of ordinary skill in the art to combine *Sato* and *Kondo* to arrive at Applicants' claimed invention.

Claims 6-10, 15-17, 32-36, 57-61, 66-68, 83-87, and 92-94 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Kondo* or *Kondo/Beardsley* or *Kondo/Sato* as applied to claims 1, 2, 3, 28, 29, 52, 53, 54, 78, 79, and 80 above, and further in view of *Berman et al.*, U.S. Patent No. 5,882,251 (hereinafter "*Berman*"). More specifically, the Examiner states that *Berman* shows a polishing pad having grooves as a way for slurry distribution and improved pad-wafer contact. The Examiner further states that the grooves in *Berman* intersect the channel on the pad and that the first grooves are perpendicular to the second grooves.

Like *Kondo*, *Beardsley*, and *Sato*, *Berman* fails to disclose the step of establishing a temperature at a contact area between a wafer and polishing member by heating and cooling a polishing solution before causing the polishing solution to be distributed at the contact area. Therefore, in that neither *Kondo*, *Beardsley*, *Sato*, or *Berman*, either alone or in combination, discloses each and every element of Applicants' claimed invention, it could not have been obvious to one of ordinary skill in the art to combine the references to arrive at Applicants' claimed invention.

Claims 12-14, 18-20, 25-27, 63-65, 69-71, 89-91, and 95-97 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Kondo* or *Kondo/Berman* as applied to claims 11, 17, 24, 62, 28, 88, and 94 above, and further in view of *Beardsley*. In particular, the Examiner states that although the prior art does not describe establishing a temperature at the contact area by circulating a heated fluid through a heat conductive platen or by heating or cooling the slurry before distributing it to the contact area, Vanell teaches that the chemical reactions are sensitive to the temperature and that reaction rate typically increases with the temperature and that the temperature is held within a certain range to control the rate of reaction. In particular, the Examiner states that Vanell teaches circulating fluid to heat or cool the platen to control the rate of reaction of the polishing process and also heats the platen to ensure the chemicals in the slurry have minimal reaction rate when starting a CMP process. The Examiner therefore contends that

it would have been obvious at the time of the invention for one of ordinary skill in the art to utilize the teachings in Vanell to control the temperature of the process to heat or cool the platen and also the slurry in order to control the rate of the reaction or to heat the slurry to ensure the chemicals in the slurry have a minimum reaction when starting a CMP process. Applicants respectfully traverse this rejection.

Applicants assume that the Examiner meant to identify the Vanell reference, U.S. Patent No. 5,945,346 (hereinafter "*Vanell*") in combination with *Kondo* or *Kondo/Berman* to reject Applicants' claims. *Vanell* discloses controlling the temperature with a heat exchanger where the heat exchanger is coupled to a platen for both heating and cooling. The heat exchanger heats the platen so that the CMP process is above a predetermined minimum temperature to ensure a minimum chemical reaction rate. Typically, the heat exchanger uses ethylene glycol as the temperature transport/control mechanism to heat or cool the platen. (See Column 9, Lines 39-56).

Vanell fails to disclose establishing a temperature at a contact area by heating and cooling the polishing solution before distributing the polishing solution to the contact area. Further Applicants assert that it would not have been obvious to one of ordinary skill in the art to heat and cool the polishing solution to establish a temperature in that heating and cooling of the polishing solution can affect reactions within the polishing solution prior to its distribution to the contact area. *Kondo*, *Berman* and *Vanell*, either alone or in combination, fail to disclose each and every element of Applicants' claimed invention. Therefore, it could not have been obvious to one or ordinary skill in the art to combine these references to arrive at Applicants' claimed invention.

Finally, claims 22, 23, 72-74, 76, 77, and 98-102 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Kondo* as applied to claims 21, 52, and 78 above, and further in view of admitted prior art. More specifically, the Examiner states that although *Kondo* does not describe the pressure as being in a range from 0.01 to 3 psi or from 0.01 to 1 psi, *Kondo* does teach a pressure of 220 g/cm^2 or 3.129 psi and further teaches that the down force is not limited to this. The Examiner further contends that using a pressure such as the claimed 0.10 to 1 psi is well known in practice by one skilled in the art as shown by admitted prior art in order to avoid

disadvantages such as edge effects. Therefore, the Examiner contends it would have been obvious to one having ordinary skill in the art at the time of the invention to use low pressure such as 0.1 to 1 psi in order to avoid defects such as edge effects and scratches on the wafer. Further, with respect to claims 72-74 and 98-100, the Examiner contends that the admitted prior art shows that forming structures having less than 0.18 μm and using lower dielectric constant material for isolation of these structures are desired to increase performance speed. Therefore, the Examiner contends that it would have been obvious to one of ordinary skill in the art to apply *Kondo*'s method to form such a structure having a small size such as that less than 0.18 μm to produce a faster device. Applicants respectfully traverse this rejection.

As set out above, Applicants assert that Kondo fails to disclose each and every element of Applicants' amended independent claims 21, 52 and 78. In particular, Kondo fails to disclose at least one bore formed within a platen which is connected to a polishing member to effect a removal rate and further fails to disclose establishing a temperature at a contact area between a wafer and polishing member by heating and cooling a polishing solution before distributing it to the contact area. Therefore, it could not have been obvious to one of ordinary skill in the art to arrive at Applicants' amended claims. Therefore, Applicants respectfully request the withdrawal of the rejection of claims 22, 23, 73-74, 76, 77 and 98-102 under 35 U.S.C. §103(a).

In view of the foregoing, Applicants respectfully submit that all of the pending claims fully comply with 35 U.S.C. §112 and are allowable over the prior art of record. Reconsideration of the application and allowance of all pending claims is earnestly solicited. Should the Examiner wish to discuss any of the above in greater detail or deem that further amendments should be made to improve the form of the claims, then the Examiner is invited to telephone the undersigned at the Examiner's convenience.

Attached hereto is a marked-up version of the changes made to the claims by the current Amendment. The attached page is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE".

Respectfully submitted.

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

Claims 1, 6-7, 14, 24, 27-29, 52, 65, 77-78, 91 and 102 have been amended as follows:

1. (AMENDED) A workpiece for removing a metallized surface from a workpiece, wherein a kinetic removal mechanism for removal of said metallized surface is characterized by a formation step for formation of a removable surface film surface and an abrasive step for removal of said film, said process comprising:

causing said workpiece to contact a polishing member while effecting relative motion between said workpiece and said polishing member; [and]

causing a polishing solution having less than 1 wt % of a polishing abrasive to be distributed at a contact area between said workpiece and said polishing member [so that said abrasive step is a rate-determining step of said removal mechanism] through at least one bore formed in a platen connected to said polishing member to affect a removal rate for removal of said film during said abrasive step; and

establishing a temperature at said contact area by heating and cooling said polishing solution before causing said polishing solution to be distributed to said contact area.

6. (AMENDED) The process of claim 2, further comprising forming on said polishing [surface] member a plurality of grooves that are configured to facilitate distribution of said polishing solution.

7. (AMENDED) The process of claim 3, further comprising forming on said polishing [surface] member a plurality of grooves that are configured to facilitate distribution of said polishing solution.

14. (AMENDED) The process of claim [11, wherein said establishing comprises connecting a platen to said polishing surface, said platen being formed of a heat conductivity material through which a fluid having a predetermined temperature

circulates] 1, further comprising circulating a fluid having a predetermined temperature through said platen wherein said platen is formed from a heat conductive material

24. (AMENDED) A process for removing a metallized surface from a workpiece, wherein a kinetic removal mechanism for removal of said metallized surface is characterized by a formation step for formation of a removable surface film and an abrasive step for removal of said film, said process comprising:

pressing said workpiece against a polishing member while effecting relative motion between said workpiece and said polishing member;

causing a polishing solution having less than 1 wt % of a polishing abrasive to be distributed to a contact area between said workpiece and said polishing member through at least one bore formed in a platen connected to said polishing member; and

establishing a temperature at said contact area while said polishing solution is distributed to said contact area [so that said abrasive step is a rate-determining step of said removal mechanism] to affect a removal rate for removal of said film during said abrasive step by heating and cooling said polishing solution before causing said polishing solution to be distributed to said contact area.

27. (AMENDED) The process of claim 24[, wherein said establishing a temperature comprises connecting a platen to said polishing member, said platen being formed of a heat conductivity material through which a fluid having a predetermined temperature circulates] further comprising circulating a fluid having a predetermined temperature through said platen wherein said platen is formed from a heat conductive material.

28. (AMENDED) The process of claim 24, wherein said causing comprises supplying said polishing solution to said contact area through a plurality of pores formed in the polishing [surface] member

29. (AMENDED) The process of claim 24, wherein said causing comprises

supplying said polishing solution to said contact area through at least one channel formed in said polishing [surface] member.

52. (AMENDED) A process for removing a copper surface from a workpiece having at least one of single damascene structures and dual damascene structures, wherein the workpiece contacts a polishing member at a contact pressure, said process comprising:

causing a polishing solution to be distributed at a contact area between said workpiece and said polishing member through at least one bore formed in a platen connected to said polishing member so that a rate of removal of said copper surface is approximately proportional to said contact pressure within a range of contact pressures, wherein said range of contact pressures comprises a low-down force pressure; and

establishing a temperature at said contact area by heating and cooling said polishing solution before causing said polishing solution to be distributed to said contact area.

65. (AMENDED) The process of claim [62, wherein said establishing comprises connecting a platen to said polishing member, said platen being formed of a heat conductivity material through which a fluid having a predetermined temperature circulates] 52 further comprising circulating a fluid having a predetermined temperature through said platen wherein said platen is formed from a heat conductive material.

77. (AMENDED) The process of claim [76] 72, wherein said causing comprises causing a polishing solution to be distributed at a contact area between said workpiece and said polishing member so that a rate of removal of said copper surface is approximately proportional to said contact pressure within a range of contact pressures, wherein said range of contact pressures comprises a low down force pressure in a range of from about 0.10 psi to about 3.0 psi.

78. (AMENDED) A process for removing a copper surface from a workpiece having at least one of a single damascene structures and dual damascene structures, wherein the workpiece contacts a polishing member at a contact pressure, said process

comprising:

causing a polishing solution having less than 1 wt % of a polishing abrasive to be distributed at a contact area between said workpiece and said polishing member through at least one bore formed in a platen connected to said polishing member so that a rate of removal of said copper surface is approximately proportional to said contact pressure within a range of contact pressures, wherein said range of contact pressures comprises a low down force pressure; and

establishing a temperature at said contact area by heating and cooling said polishing solution before causing said polishing solution to be distributed to said contact area.

91. (AMENDED) The process of claim [88, wherein said establishing comprises connecting a platen to said polishing member, said platen being formed of a heat conductivity material through which a fluid having a predetermined temperature circulates] 78 further comprising circulating a fluid having a predetermined temperature through said platen wherein said platen is formed from a heat conductive material.

102. (AMENDED) The process of claim [101] 98, wherein said causing comprises causing a polishing solution having less than 1 wt % of a polishing abrasive to be distributed at a contact area between said workpiece and said polishing member so that a rate of removal of said copper surface is approximately proportional to said contact pressure within a range of contact pressures, wherein said range of contact pressures comprises a low down force pressure in a range of from about 0.10 psi to about 3.0 psi.—